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Trigger Mechanism for Fluorescent Tubes

The invention relates to a trigger mechanism for fluorescent tubes.

Displays of multimedia systems are sometimes illuminated by means of fluorescent tubes. In this case, several tubes may be used, especially for higher light output when an individual fluorescent tube has a limited maximum permitted light output. A special electronic trigger is required to operate the fluorescent tubes. For cost reasons, sometimes two fluorescent tubes are hooked up in parallel to a trigger and operated with a single transformer circuit.

On account of tolerances in the characteristics of the fluorescent tubes, faults can occur. In this case, the current dictated by the trigger is not distributed uniformly over the parallel-connected fluorescent tubes. They have a negative internal resistance, i.e., the maximum ignition voltage occurs at minimum lamp current. Thus, a parallel circuit results in an unstable system, in which the current may flow entirely through one fluorescent tube with low resistance and leave the other fluorescent tube without current. By using series-connected ballast resistances or impedances, the lamp currents can be kept symmetrical at sufficient current strengths, since the ballast resistances determine the voltage divider ratio and thus, in turn, the currents in the two branches. But when the current strength is rather low, the voltage drop across the ballast resistances is so low that the voltage divider is determined by the now relatively high lamp resistance. The circuit can become asymmetrical even in presence of low stray capacitances, which can totally disable a lamp. Although the control circuit, such as a controller IC, can register this as a drop

below a predetermined minimum current value and reduce the lamp current—for example, in a fault mode or error mode—and again ignite the lamp in a following burst mode to ignite the lamp once again, if the low current strength through this lamp continues then this behavior may repeat itself, so that the lamp will flicker. When the brightness is set low—i.e., a high dim rate—a flickering of the display brightness can therefore occur.

The invention is based on the goal of creating a trigger circuit for fluorescent tubes that prevents, with relatively little expense, an unstable behavior of the lamps, especially a flickering.

The goal is achieved by a trigger mechanism according to Claim 1. The dependent claims describe preferred embodiments. In particular, Claim 5 creates a trigger circuit and Claim 6, a lamp circuit.

According to the invention, therefore, the setting range or dim range of the lamp currents is divided into a brighter region (day mode) and a darker region (night mode). Detection of the lamp currents is effected by a suitable control circuit, already recognized as being fundamental for this, such as an integrated controller, like the LT1768, with corresponding detection inputs.

In the night mode, the lamp currents are evaluated jointly. The joint evaluation can occur, in particular, by connecting the two detection inputs via a switch. This has the result that, when the behavior of the fluorescent tubes is asymmetrical, neither of the detection inputs recognizes a current that is so weak that it is reduced further. Therefore, the two tubes shine with constant, low brightness, and any asymmetries due to the lower current strengths do not result in disruption of

one of the fluorescent tubes. In the day mode with higher current strengths, a separate evaluation and setting of the currents occurs according to the invention.

The invention will be described in greater detail hereinbelow by means of the enclosed drawing of a sample embodiment. The figure shows a block diagram of a lamp circuit.

A lamp circuit 1 has a trigger mechanism 2 with a suitable control circuit 3, e.g., a controller IC. Such a controller IC is available, for example, under the name LT1768. In the trigger mechanism 2, furthermore, a switch 4 is provided between detection inputs a2, a3 or the connected lines DIO1 and DIO2, which can be designed for example as a semiconductor switch, being open in a day mode and closed in a night mode.

Connection contacts 8 and 10 for fluorescent tubes 6 and 7 are connected to the lines DIO1 and DIO2. To the other connection contacts 9 and 11 of the fluorescent tubes 6 and 7 are connected ballast capacitors CL12 and CL13, so that two parallel and symmetrical current paths S1 and S2 are formed. The current paths S1, S2 are joined across a common connection line 14 and connected to a transformer circuit 5, which is familiar in itself.

The control circuit 3 detects the currents arriving via the detection inputs a2 and a3 and adjusts suitable lamp currents. In the day mode with higher current strengths, the lamp currents I1, I2 each flow to the corresponding input a2 and a3, so that they can be detected and adjusted separately. In the night mode with lower current strengths and closed switch 4, the lamp currents I1, I2 of both inputs a2, a3 can be detected. The voltage dropping across the current paths S1 and S2 drops

essentially across the fluorescent tubes 6 and 7 when the current strengths are low. If more asymmetrical behavior occurs, for example so that a smaller current I1 flows through the tube 6, a2—as well as a3—will therefore still take up both currents I1 and I2 or a portion of the sum of both currents. This prevents recognition of failure of the tube 6 in a2 and subsequent re-ignition of the tube 6 in a burst cycle. Therefore, in the night mode, a periodic reducing and reactivation of the current of the less-bright tube is prevented and uniform lighting – asymmetrical if desired – is achieved.

List of reference numbers

1	lamp circuit
2	trigger mechanism
3	control circuit
4	switch
5	transformer circuit
6	fluorescent tube
7	fluorescent tube
8	connection contact
9	connection contact
10	connection contact
11	connection contact
14	connection line
CL12	ballast capacitor
CL13	ballast capacitor
a1-4, b1-4	inputs of 3
G	ground connection of 3
VC	operating voltage input of 3